REMARKS

Claims 1 to 5 are currently pending in the present application. Claims 1 is amended herein for purposes of form. No new matter has been added.

Claims 1 to 5 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,125,193 to Han et al. (hereinafter "Han"). Applicants respectfully submit that Han does not expressly or inherently disclose all of the elements set forth in independent claims 1, 4 and 5. Thus, Han does not anticipate claim 1, claims 2 and 3 which depend therefrom, and claim 4 and claim 5.

Claim 1 is directed to an apparatus for generating images of a subject on the basis of 3D-constructions from 3D-XRAY or 3D-Computer Tomography measurements, which subject comprises both natural tissue and one or more high-density objects, said apparatus comprising a measuring facility for executing said measurements, a distinguishing facility for distinguishing said one or more high-density objects and executing a separating procedure thereon for generating an image of regions of said natural tissue. The apparatus of claim 1 comprises: a ramp-filtering facility for applying a ramp filter in the direction of rotation to such various projection measurements and a back-projecting facility fed by said ramp-filtering facility for back-projecting the various so filtered projections into a 3D-volume reconstruction; a segmenting facility fed by said back-projecting facility for in said 3D-volume reconstruction segmenting said one or more high-density objects by a thresholding procedure and a forward projecting facility fed by said segmenting facility for executing a forward projection of the shadow(s) of the segmented one or more high-density objects onto the ramp-filtered projection, whilst marking the borders of said one or more high density objects in the ramp-filtered back-projections; a suppressing facility fed by said forward projecting facility for suppressing said reconstructed one or more high-density objects from the original projection measurements and said suppressing facility is operative for executing an appropriate substitution of gray values derived from a physical neighbourhood of said one or more high-density objects instead of said one or more high-density objects in question; and a

retro-coupling facility fed by said suppressing facility for executing a back-projection of the various filtered projections with corrected profiles through exclusion of said suppressed one or more high-density objects and outputting a reconstruction result.

Claim 4 is directed to a method of generating images of a human or animal body on the basis of 3D-constructions from 3D-XRAY or 3D-Computer Tomography measurements, which bodies comprise both natural tissue and one or more high-density objects, said method comprising the steps of executing said measurements, distinguishing said one or more high-density objects and executing a separating procedure thereon for generating an improved image of regions of said natural tissue. The method of claim 4 comprises the steps of: applying a ramp filter in the direction of rotation to such various projection measurements and back-projecting the various filtered projections into a 3D-volume reconstruction; in said 3D-volume reconstruction segmenting said one or more high-density objects by a thresholding procedure and executing a forward projection of the shadow(s) of the segmented one or more high-density objects onto the ramp-filtered projection, thus marking the borders of said one or more high density objects in the ramp-filtered back-projections; suppressing said reconstructed one or more high-density objects from the original projection measurements whilst executing an appropriate substitution of gray values derived from a physical neighbourhood of said one or more high-density objects instead of said one or more high-density objects in question; and secondarily executing a back-projection of the various filtered projections with corrected profiles and thereby without said suppressed one or more high-density objects.

Claim 5 is directed to a computer readable medium containing instructions for controlling a computer system to perform the steps of a method of generating images of a subject on the basis of 3D-constructions from 3D-XRAY or 3D-Computer Tomography measurements, which subject comprises both natural tissue and one or more high-density objects, said method comprising the steps of executing said measurements, distinguishing said one or more high-density objects and executing a separating procedure thereon for generating an improved image of regions of said natural tissue. The computer readable medium of claim 5 comprises the steps of: applying a ramp filter in the direction of

rotation to such various projection measurements and back-projecting the various filtered projections into a 3D-volume reconstruction, in said 3D-volume reconstruction segmenting said one or more high-density objects by a thresholding procedure and executing a forward projection of the shadow(s) of the segmented one ore more high-density objects onto the ramp-filtered projection, thus marking the borders of said one or more high density objects in the ramp-filtered back-projections; suppressing said reconstructed one or more high-density objects from the original projection measurements whilst executing an appropriate substitution of gray values derived from a physical neighbourhood of said one or more high-density objects instead of said one or more high-density objects in question; and secondarily executing a back-projection of the various filtered projections with corrected profiles and thereby without said suppressed one or more high density objects.

Han fails to disclose an apparatus, a method or a computer readable medium for generating images of a subject on the basis of 3D-constructions from 3D-XRAY or 3D-Computer Tomography measurements employing a ramp-filtering facility for applying a ramp filter in the direction of rotation to such various projection measurements and a back-projecting facility fed by the ramp-filtering facility for back-projecting the various so filtered projections into a 3D-volume reconstruction, as clearly claimed in claims 1, 4 and 5. As described in the present application, suppression of a high-density object using ramp-filtered projections improves and simplifies image reconstruction (see page 3, lines 33-34). By way of example, Figure 2a of the present application shows a projection image wherein bullets, numbered 1, 2 and 3 are clearly visible in the form of black circles. In the ramp-filtering step, all projections are ramp-filtered and used for a 3D-reconstruction through back-projection with the well-known Feldkamp algorithm. Ramp-filtering results in sharper edges of the bullets, and the 3D-reconstruction enhances the contrast. Through so acting, the segmentation of the high-density objects from the surrounding tissue or structures of their neighborhood can more readily and accurately be effected. Moreover, the bullets can be discriminated by a simple threshold, so that in consequence only the bullets themselves are visible in the form of points with encircling rings.

Han also fails to disclose an apparatus, a method or a computer readable medium for generating images of a subject on the basis of 3D-constructions from 3D-XRAY or 3D-Computer Tomography measurements employing segmenting facilities. Specifically, Han fails to disclose a segmenting facility fed by the back-projecting facility for in the 3D-volume reconstruction segmenting the one or more high-density objects by a thresholding procedure and a forward projecting facility fed by the segmenting facility for executing a forward projection of the shadow(s) of the segmented one or more high-density objects onto the ramp-filtered projection, whilst marking the borders of the one or more high density objects in the ramp-filtered back-projections, as clearly claimed in claims 1, 4 and 5.

As discussed in the present application, the inventors have found that the results according to the present invention are improved when using ramp-filtered projections in combination with a 3D-reconstruction. The result is that the edges of the high density bodies are much sharper and the contrast is improved. In this manner, segmentation of the implants from the surrounding structures is improved and segmentation can be easily performed with a simple threshold. Thus, ramp-filtering and segmentation are important aspects of the present invention, inasmuch as segmentation algorithms are typically complex and thereby, time-consuming to perform. The disclosure of Han is bereft of any description of ramp-filtering step employed in combination with a segmentation step. Rather, Han simply discloses a method wherein an image is obtained by irradiating a subject with x-rays and detecting the x-rays after they have passed through the subject.

Accordingly, for at least these reasons, independent claims 1, 4 and 5 are patentable over Han. Since claims 2 and 3 depend from claim 1 and provide further features, and claim 5 depends from claim 4 and provides further features, these claims are clearly distinguishable over Han for at least the reasons discussed. Accordingly, the rejections under 35 U.S.C. § 102(b) of claims 1 through 5 should be withdrawn and claims 1 through 5 should be allowed.

Appl. No. 10/524,422
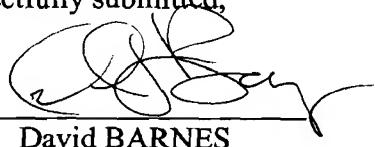Customer No. 24737

Page 9 of 9

Conclusion

In view of the foregoing, Applicants respectfully submit that the specification, the drawings and all claims presented in this application are currently in condition for allowance. Accordingly, Applicants respectfully request favorable consideration and that this application be passed to allowance.

Should any changes to the claims and/or specification be deemed necessary to place the application in condition for allowance, the Examiner is respectfully requested to contact the undersigned to discuss the same.

Applicants' representative believes that this response is being filed in a timely manner. In the event that any extension and/or fee is required for the entry of this amendment the Commissioner is hereby authorized to charge said fee to Deposit Account No. 14-1270. An early and favorable action on the merits is earnestly solicited.

Respectfully submitted,

By:_____

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